

pH lab

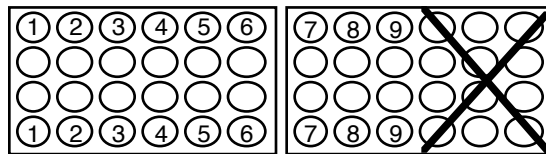
Name: _____

DAY 1 - Indicator Reference Set

Part 1 - Making a serial dilution

You will make your own indicator reference set which will be used to determine the pH of several acids & bases located on top of the lab shelf. --- pay attention to the details described below --

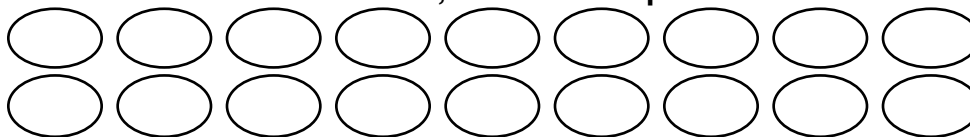
- Place two well plates side by side lengthwise as shown in the figure at right.
- Add 20 drops of 0.1 M HCl solution to the first well (A-1) of the first plate.



- Add 18 drops of water to the remaining 8 wells in that row (A-2 thru A-9).
- Draw up some of the 0.1 M HCl from A-1 into the stem of the pipet and squeeze out two drops of it into the second well (A-2), then put the rest back in the previous well (A-1), then go back to A-2 and mix it well with your pipet.
- Now draw up some of the solution from A-2 (which should be 0.01 M HCl) into the stem of the pipet and squeeze out two drops of it into the third well (A-3), then put the rest back in the previous well (A-2), then go back to A-3 and mix it well with your pipet.
- Continue on with this process all the way down the line. (These solutions represent HCl concentrations from 1×10^{-1} M to 1×10^{-12} M)
- Repeat this exact same procedure across the bottom row (B-1 thru B-9) starting with 0.1 M NaOH instead of 0.1 M HCl.
- To each of the dilutions, add 5 drops of the red cabbage indicator. *very important*

You should realize that the 0.1 M HCl is a strong acid with a pH of 1, and that when it is diluted ten fold (down to 0.01M) it has a pH of 2... but that it obviously cannot be diluted past pH 7. Likewise, the 0.1 M NaOH solution is a strong base (pH 13) and when it is diluted to 0.01 M it has a pH of 12...

In the circles below, indicate the pH of each well:



Part 2 - Using your indicator reference set to test pH

Add about 15 drops of each solution to any empty wells and then add 5 drops of the red cabbage indicator to each well. *Return pipets immediately to proper cups!* Record observations below:

	guess pH	indicator color	acid or base?	indicator pH
baking soda				
aspirin				
Tap Water™				
antacid				
0.1 M HCl				
0.1 M NaOH				
0.1 M NH ₃				
0.1 M HC ₂ H ₃ O ₂				
lemon juice				
bleach				
Sprite®				

DAY 2 - acid / base / pH stations

STATION 1,2,3: CONDUCTIVITY

Use the conductivity meter to determine the conductivity of each of the solutions below. Be sure to **wipe the meter probes clean** with a paper towel after each solution is tested! Record the relative conductivity (N,W,S), and using your knowledge about strong/weak/non electrolytes, write the dissolving reactions for each solution:

	conductivity	dissociation reaction (be sure to use the symbols (s) or (aq) where appropriate!)	
0.1 M HCl		$\text{HCl}_{(aq)} \rightarrow$	
0.1 M $\text{HC}_2\text{H}_3\text{O}_2$			①
0.1 M NaOH			
0.1 M $\text{C}_6\text{H}_{12}\text{O}_6$			②
0.1 M NaCl			
0.1 M NH_3		$\text{NH}_3_{(g)} + \text{H}_2\text{O}_{(l)} \rightarrow$	
tap water		for the NH_3 sample (above), identify...	③
distilled water		acid _____ conjugate base _____ base _____ conjugate acid _____	

STATION 4: PINK TORNADO

Observe the beaker that contains a magnetic stirrer in a solution. Add **two drops** of the NaOH solution and watch what happens. Be sure to avoid contamination by not letting the tip of the pipet touch the solution.

Observation: _____

What 2 chemicals do you think are inside the beaker?

STATION 5: RAINBOW TUBE

Place a rubber stopper securely in the bottom of a plastic tube, then fill to within 2 cm of the top with green indicator solution. Add 3 drops of 0.1 M HCl. Stopper the top end & invert the tube. Unstopper the end which is now on top and add 3 drops of 0.1 M NaOH. Stopper and invert again. Keep flipping the tube over to allow the bubble to go up and down. Observations:

Explain what's happening, and state how good a mixing technique is this repeated inversion?!?

STATION 6: GOLDENROD PAPER

Use 1 piece of goldenrod paper. Dip cotton swab in NH_3 solution & use it to draw on the goldenrod paper. Next, get a clean cotton swab & dip it in the $\text{HC}_2\text{H}_3\text{O}_2$ solution. Use it to re-draw on the paper. Record observations: **(THROW AWAY TRASH!)**

STATION 7: COMPUTER SIMULATION SOFTWARE - (do only the problems indicated on the blue card)

STATION 8: COMPUTER SIMULATION SOFTWARE - (do only the problems indicated on the blue card)

STATION 9: Relaxation Station - sit back, take a load off your feet, and soak it all in